TALANOV, P. I. and [illegible]. Y. SHE[illegible].

Ispol'zovanie chugunnoi i stal'noi struzhki pri plavke v vagranke. (Moskva) Mashgiz, 1943. 1[illegible] p. diagrs.

(Utilization of cast-iron and steel chips in cupola furnaces during the smelting process.)

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

LADYZHENSKIY, Boris Nikolayevich; TUNKOV, Vladimir Pavlovich; ZVEREV, K.M., inzh., retsenzent; KRESHCHANOVSKIY, N.S., kand.tekhn.nauk, retsenzent; TALANOV, P.I., prof., red.; SIROTIN, A.I., inzh., red.izd-va; EL'KIND, V.D., tekhn.red.

[Technology of preparing steel castings] Tekhnologiia izgotovleniia stal'nykh otlivok. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1958. 255 p. (MIRA 11:4)

(Steel castings)

AKSENOV, P.N.; OKROMESHKO, N.V.; STOLBOVOY, S.Z.; TALANOV, P.I., prof., retsenzent; POLOZKOV, M.A., inzh.; SALTYKOV, V.S., inzh.; UVAROVA, A.F., tekhn.red.

[Structural design of foundry machinery] Konstruktivnye chertezhi mashin liteinogo proizvodstva; atlas. Moskva, Gos. nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1959. 217 p. (MIRA 12:12)

(Foundry machinery and supplies)

S/128/60/000/004/005/006
A104/A133

AUTHORS: Talanov, P. I., and Astafurova, N. I.

TITLE: The pecularities of cerium modification of cast iron

PERIODICAL: Liteynoye proizvodstvo, no. 4, 1960, 42-44

TEXT: In view of technological difficulties in the production of modular cast iron modified with magnesium, experiments are being carried out to modify cast iron with cerium [Savitskiy, Ye. U - Ref. 1: Redkiye metally i splavy (Rare Earth Metals and Alloys), Metallurgizdat, 1959; Shkol'nikov, E. M., Bondarenko, L. G., Zakharov, V. A., Chichagova, N. P. - Ref. 2: "Liteynoye proizvodstvo", no. 2, 1960]. During experiments cerium was added as misch metal (56% Ce, 18% La, up to 1.6% Fe, 0.056% Zn, 0.026% Cl, 0.02% S, 0.015% P, the rest being Nd, Pr, Sm). Cast iron was smelted in a blast cupola, charged until the required chemical composition was attained and overheated to 1,500 - 1,550°C in a h-f inductive furnace. Hypoeutectic cast iron was obtained by the addition of low-carbon steel, a hypereutectic composition by the addition of silver graphite. The cast iron was then cooled to 1,380 - 1,400°C and modified. The misch metal was added with the aid of

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The pecularities of cerium...

a perforated tube. After two minutes the cast iron was stirred, the slag removed and 0.3% Si75 added. There were no cast iron ejections and its temperature increased by 20 - 30°C. The chemical compositions of the obtained cast irons and results of mechanical tests are shown in Table 1. It was found that their tensile strength is higher than their bending strength. At equal quantities of the modifier the relative hardening of hypereutectic cast irons is higher than that of hypoeutectic ones. Microstructural tests showed that the modification with misch metal does not affect the basic metal structure which consisted of pearlite and 5 - 10% ferrite in all cases. In hypoeutectic cast iron spheroidal graphite was found after addition of a 0.3% modifier, in hypereutectic cast iron after 0.5%. However, even the addition of 0.7% modifier failed to achieve a complete spheroidization of graphite, due to the increased amount of sulfur and its reaction with cerium. To eliminate the effect of sulfur, additional smeltings of cast iron were carried out under the same conditions as before. The chemical composition and the results of mechanical tests are given in Table 2. Modification with misch metal does not affect the casting properties of cast iron. Its fluidity increases and reaches its maximum at 0.5% of misch metal. Larger quantities

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of modifier decrease the fluidity due to the formation of a great amount of ceric oxide in the metal. Linear shrinkage varied between 0.7 - 1.0%. Since the modification of cast iron with cerium proved superior to magnesium modification, further tests included the combined modification with magnesium and misch metal of desulfurized cast iron. It was established that simultaneous addition of solid magnesium and misch metal reduces the pyroeffect. The chemical composition and the mechanical properties of the tested cast irons are shown in Table 3. The combined modification with separate addition of magnesium and misch metal improves the quality of cast iron. Although the spheroidizing ability of the misch metal is inferior to that of magnesium, it neutralizes the adverse effect of titanium, bismuth etc. during the combined modification. There are 3 tables, 3 figures and 2 Soviet-bloc references.

The peculiarities of cerium...

S/128/60/000/004/005/006
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Table 1

Таблица 1

1) Добавка миш-металла в %	2) Химический состав в %: $C_{об}$	$C_{св}$	Si	Mn	P	S	3) Углеродный эквивалент $C_э$	4) Предел прочности в кг/мм²: 5) при растяжении	6) при изгибе
—	3,99	0,41	2,17	0,63	0,16	0,08	4,7	10,8	25,1
0,3	3,98	0,50	2,15	0,64	0,15	0,08	4,7	18,2	38,1
0,4	3,98	0,62	2,15	0,63	0,15	0,06	4,7	21,6	42,3
0,5	3,95	0,81	2,11	0,65	0,14	0,05	4,6	26,0	46,3
0,6	3,95	0,88	2,09	0,66	0,15	0,04	4,6	29,0	51,2
0,7	3,94	0,66	2,06	0,65	0,15	0,03	4,6	29,1	56,1
—	2,62	0,71	1,86	0,58	0,12	0,07	3,2	25,8	45,3
0,3	2,62	0,84	1,84	0,60	0,11	0,07	3,2	38,3	62,4
0,4	2,61	0,84	1,55	0,52	0,12	0,07	3,2	39,4	61,0
0,5	2,58	0,90	1,84	0,51	0,13	0,05	3,2	36,0	61,5
0,6	2,56	0,89	1,75	0,52	0,11	0,06	3,1	38,2	60,0
0,7	2,53	0,56	1,50	0,57	0,11	0,06	3,1	38,5	61,0

Table 1:

(1) misch metal addition in %;
(2) chemical composition in %;
(3) carbon equivalent;
(4) strength limit in kg/mm²;
(5) tensile strength limit;
(6) bending strength limit.

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The pecularities of cerium... S/128/60/000/004/005/006
A104/A133

Table 2:

(1) misch metal addition in %;
(2) chemical composition in %;
(3) carbon equivalent;
(4) strength limit in kg/mm²;
(5) tensile strength limit;
(6) bending strength limit.

Table 2 Таблица 2

1) Добавка мишметалла в %	2) Химический состав в %: $C_{об}$	Si	Mn	P	S	3) Углеродный эквивалент $C_э$	4) Предел прочности в кг/мм²: 5) при растяжении	6) при изгибе
—	26,5	1,82	0,60	0,10	0,03	3,2	26,4	46,2
0,3	2,63	1,84	0,52	0,10	0,02	3,2	40,4	66,1
0,4	2,65	1,83	0,55	0,11	0,01	3,2	39,3	67,0
0,5	2,58	1,81	0,56	0,10	0,01	3,2	39,5	62,5
0,6	2,56	1,81	0,57	0,11	0,01	3,1	40,1	68,4

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The pecularities of cerium...

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Table 3

Таблица 3

1) Добавка модификатора в %	2) Химический состав в %: $C_{об}$	Si	Mn	P	S	3) Углеродный эквивалент $C_э$	4) Предел прочности в кг/мм²: 5) при растяжении	6) при изгибе
7) Без модификатора	2,7	2,21	0,53	0,11	0,01	3,4	25,9	46,1
8) 0,4 мишметалла	2,71	2,21	0,60	0,12	0,009	3,4	39,3	66,4
9) 0,4 магния	2,69	2,25	0,58	0,10	0,009	3,4	46,1	69,3
10) 0,2 мишметалла + 0,2 магния	2,69	2,20	0,53	0,11	0,003	3,4	60,9	71,2

Table 3:

(1) modifier addition in %;
(2) chemical composition in %;
(3) carbon equivalent;
(4) strength limit in kg/mm^2;
(5) tensile strength limit;
(6) bending strength limit;
(7) without modifier;
(8) 0.4 misch metal;
(9) 0.4 magnesium;
(10) 0.2 misch metal + 0.2 magnesium.

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TALANOV, P.I.; ASTAFUROVA, N.I.

Brittleness of cast iron containing cerium. Lit. proizv. no.3:27-28 Mr '61. (MIRA 14:6)

(Cast iron--Brittleness)
(Cerium)

S/148/61/000/005/014/015
E071/E135

AUTHORS: Talanov, P.I., and Astafurova, N.I.

TITLE: An investigation of the technological conditions of the inoculation of cast iron with a cerium alloy

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, No.5, pp. 177-183
vol. 4

TEXT: The influence was investigated of the temperature to which cast iron was initially heated up and the temperature at which it was subsequently inoculated with a cerium alloy on the properties of low sulphur, low phosphorus iron with an eutecticity of 0.9 and 1.0. A cerium alloy FMTs-6 (50.4% Ce, 3.3 Fe, 6.3 Mg, remainder other rare earth elements) and the following two types of iron:

Eutecticity	C	Si	Mn	P	S
0.9	3.25	2.20	0.50	0.10	0.04
1.0	3.60	2.85	0.60	0.12	0.06

were used for the experiments. Iron was melted in a 50 kg induction furnace, heated to 1550 °C, transferred into a preheated ladle where it was retained to a given inoculation temperature (1350, 1400, 1450

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S/148/61/000/005/014/015
E071/E135

An investigation of the technological conditions of the inoculation of cast iron with a cerium alloy

and 1500 °C). The inoculant was introduced on a rod in an amount of 0.5% of cerium alloy and 0.4% of ferrosilicon. The iron was teemed into semis of 50 and 100 mm diameter. The influence of the inoculation temperature was evaluated on the basis of changes in the tensile and bending strength. The coefficients of quasiisotropy were calculated from the equation

$$\frac{\sigma_D}{\sigma_d} = \left(\frac{D}{d}\right)^{-x}$$

where σ_D and σ_d - tensile strength (or bending) in two cross-sections under comparison; D and d - corresponding diameters; x - coefficient of quasiisotropy, designated by a for tensile and by b for bending strength. It was found that an increase in the inoculation temperature to 1400 °C has no practical influence on the properties, but with a further increase in the temperature a considerable increase in the strength characteristics as well as of the coefficients of quasiisotropy a and b was obtained.

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E071/E135

An investigation of the technological conditions of the inoculation of cast iron with a cerium alloy

The best results for the latter coefficients were obtained at temperatures of 1440-1470 °C; a further increase gave some deterioration. In cast irons inoculated at 1350 °C no changes in the structure were observed; graphite was present only in plate form. At 1400 °C only a small proportion of the graphite was in globular form; at 1440-1470 °C the whole graphite in both cast irons became globular. At 1500 °C the amount of graphite and the degree of its dispersion decreased. With increasing inoculation temperature the proportion of pearlite in the structure of both cast irons increases and of ferrite decreases, and at 1500 °C the presence of structurally free cementite was observed. The presence of the latter had little effect on the strength characteristics of the iron, but lowered its plasticity, the coefficients of quasi-isotropy and workability. Thus, for cast irons of an eutecticity of 0.9-1.0, inoculation with 0.3% of FMTs-6 alloy and 0.4% of ferrosilicon for an initial heating temperature of 1550 °C, the optimum inoculation temperature is within the range 1440-1470 °C.

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E071/E135

An investigation of the technological conditions of the inoculation of cast iron with a cerium alloy

To determine the influence of the initial heating temperature, experiments were carried out in which the iron was heated to 1500, 1550 and 1600 °C, transferred into a ladle, retained to a temperature of 1460 ± 15 °C and then inoculated. Semis were cast at a temperature of 1340-1320 °C. With increasing heating temperature the composition of the iron remained unchanged, with the exception of carbon (which was decreasing). With increasing heating temperature, the absolute values of the strength characteristics change only a little but the coefficients of quasi-isotropy improve. The positive influence of the preliminary heating of iron to a higher temperature appears to be associated with an improvement in the degassing, coagulation and flotation of inclusions and solution of graphite foam which always interferes with the formation of regularly shaped globular graphite during subsequent inoculation. More than 50 industrial heats produced in various furnaces confirmed the laboratory results. Cupola iron of a similar composition, the temperature of which in the runner was

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S/148/61/000/005/014/015
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An investigation of the technological conditions of the inoculation of cast iron with a cerium alloy

1400-1420 °C could not be inoculated even with 1% of FMTs-6 alloy. Overheating of this iron in an electric furnace to 1550-1580 °C with subsequent inoculation at 1440-1460 °C produced completely globular graphite. When melting of this iron was carried out in an electric furnace, a preliminary heating temperature of 1470-1500 °C was found to be sufficient. It is concluded that a successful inoculation of iron with the cerium alloy can be obtained only at certain temperature conditions of preliminary heating and inoculation; these temperatures differ for a cast iron melted in different furnaces.

There are 5 figures, 4 tables and 3 Soviet references.

ASSOCIATION: Moskovskiy stanko-instrumental'nyy institut (Moscow Machine Tool Institute)

SUBMITTED: October 11, 1960

Card 5/5

SERGEICHEV, Nikolay Fedorovich; TALANOV, P.I., prof., retsenzent; KOCHUROV, A.S., inzh., retsenzent; LOS'KOV, D.I., dotsent, red.; ZHIDKIKH, I.A., inzh., red.; BORISOV, A.P., inzh., red.; BLANK, E.M., inzh., red.; BOGOSLAVETS, N.P., tekhn. red.

[Manufacture of models] Model'noe proizvodstvo. Moskva, Mashgiz, 1962. 158 p. (MIRA 15:6)

(Models and modelmaking)

MARIYENBAKH, L.M.; BARBASHIN, N.N.; kand. tekhn. nauk, dots.; retsenzent; TALANOV, P.I., prof., [illegible]

[Foundry furnaces] Pechi v liteinom proizvodstve. Izd.2., dop. i perer. Moskva, Mashinostroenie, 1964. 355 p. (MIRA 17:12)

[illegible], [illegible]; [illegible], A.S.

[illegible] of grey cast iron [illegible]. [illegible] no.3:25-27 Mr '64. [illegible]

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0"

TALANOV, P.I.; KOTSYUBINSKIY, O.Yu.; ZAL'TSMAN, E.S.

Methods of calculating the cooling of a casting in a multi-layer mold. Izv. vys. ucheb. zav.; chern. met. 7 no.7:195-201 '64 (MIRA 17:8)

1. Moskovskiy stankoinstrumental'nyy institut.

[illegible]

Apparatus for testing materials for wear in reciprocating motion. Zav. lab. 30 no.5:613-614 '64. (MIRA 17:5)

1. Moskovskiy stankoinstrumental'nyy institut.

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0"

[illegible]

[illegible]

[illegible], [illegible] nauk. Prof.; [illegible], [illegible] red.

[illegible] (Praktika [illegible]) [illegible] 86 p.
[illegible] Tashkent [illegible]

TALANOV, P.I., prof.; BREDIS, V.E., inzh.

Dimensional connections and errors in sand molds. Lit. proizv. no.9: 6-7 S '65. (MIRA 18:10)

TALANOV, P.I.; KV..BA, I.S.; MOKHOV, V.N.

Effect of thermal stresses in green molding mixtures [illegible] formation of shrinkage cavities. Izv. vys. ucheb. zav.; [illegible] met. 8 no.11:148-152 '65. (MIRA 18:1[illegible])

1. [illegible] pri Moskovskom avtomobil'nom zavode im. Likhacheva.

TALANOV, S.I., polkovnik meditsinskoy sluzhby

Main problems in the organization of therapeutic and prophylactic services for the troops during camping periods. Voen.-med. zhur. no.5:39-42 My '50. (MLRA 9:9)
(MILITARY HYGIENE)

ZHUKOV, A.P., inzh.; TALANOV, S.I., inzh.

Pumping station built of reinforced cement. Biul.tekh.inform. po stroi. 5 no.10:28 O '59. (MIRA 13:3)
(Pumping stations)
(Reinforced concrete construction)

TALANOV, V. D.

AID Nr. 987-3 11 June

HEAT TRANSFER OF LIQUID METALS IN PIPE FLOW (USSR)

Subbotin, V. I., P. A. Ushakov, B. N. Gabrianovich, V. D. Talanov, and I. P. Sviridenko. Inzhenerno-fizicheskiy zhurnal, v. 6, no. 4, Apr 1963, 16-21.
S/170/63/000/004/002/017

The Physics and Power Engineering Institute in Obninsk studied heat transfer from Hg at 18 to 60°C and from NaK alloy (22% Na, 78% K) at 70 to 110°C. Three test sections were used. The first consisted of a polished steel tube (20-mm diameter, 0.3-mm wall thickness) to which copper rings (43-mm diameter) were welded at 1-mm intervals. The thermocouples were located inside the copper rings. The second section contained a nickel tube (12-mm diameter, 0.4-mm wall thickness) also equipped with copper rings. The third section consisted of a machined copper tube with a 40-mm outer and a 20.8-mm inner diameter. Two series of experiments were conducted with NaK: 1) at $470 < Pe < 7900$, with oxide contents in the metal ranging from $3 \cdot 10^{-4}$ to $7 \cdot 10^{-4}$ wt %; 2) at $107 < Pe < 640$, with oxide contents of $1 \cdot 10^{-3}$ to $5.2 \cdot 10^{-3}$ wt %. The results showed that the Nusselt number for Hg in nickel and steel tubes and for NaK in copper tubes is identical. This indicates

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AID Nr. 987-31 11 June

HEAT TRANSFER OF LIQUID METALS IN PIPE FLOW [Cont'd] S/170/63/000/004/002/017

that thermal contact resistance is practically absent under the conditions studied. Oxides in concentrations from $3 \cdot 10^{-4}$ to $5 \cdot 10^{-3}$ wt % did not affect heat transfer in NaK. The following formula is recommended at $0.002 \ll Pr \ll 0.003$ and $20 \ll Pe \ll 1000$ for metals containing oxides in concentrations below the solubility limit: $Nu \approx 4.3 + 0.025\ Pe^{0.8}$. [PV]

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USHAKOV, P.A.; SUBBOTIN, V.I.; GABRIANOVICH, B.N.; TALANOV, V.D.;
SVIRIDENKO, I.P.

Heat transfer and hydraulic resistance of close-packed bundles of rods arranged in-line. Atom. energ. 13 no.2:162-169 Ag '62. (MIRA 15.8)

(Heat--Transmission) (Nuclear reactors)

L 5172-66 EPA(s)-2/EWT(m)/EPF(n)-2/T/EWP(t)/EWP(b) IJP(c) JD/WW/
ACCESSION NR: AT5022450 JG/GS UR/0000/65/000/000/0001/0022

AUTHOR: Subbotin, V. I.; Ushakov, P. A.; Zhukov, A. V.; Talanov, V. D.; Kudryavtseva, L. K.; Sviridenko, Ye. Ya.; Vasil'yeva, L. V.

TITLE: Investigation of the temperature distribution in core and shield elements of BN-350 reactor by means of experimental models 19

SOURCE: Obninsk. Fiziko-energeticheskiy institut. Doklady, 1965. Eksperimental'noye issledovaniye na modelyakh poley temperatury 38
teplovydelyayushchikh elementov aktivnoy zony i ekrana reaktora 37
BN-350, 1-22 B+1

TOPIC TAGS: nuclear power reactor, fast reactor, liquid metal cooled reactor 18

ABSTRACT: The distribution of temperatures in various parts of a 350 Mw fast-neutron sodium-cooled reactor was investigated by means of two special experimental models. The first model consisting of two loops was similar to the core of the BN-reactor while the second model was arranged for investigation of heat transfer in the shielding area. Particular attention was given to the centrally and peripherally located fuel elements that is to the fuel assemblies submitted to different heat transfer conditions. The core primary

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L 5172-66

ACCESSION NR: AT5022450

loop was cooled by sodium while a sodium-potassium compound was used as coolant for the secondary core loop as well as for fuel elements placed within lateral shields. The core model consisted of 37 tubes of which 34 tubes were provided with special welded fins. The shield model had an assembly of 19 tubes. A detailed description of the experiments was given and the results were analyzed. The irregularities in temperature distribution were graphically presented in 10 figures. It is proposed to resume the research on temperatures by using new models because the evaluation of temperature ranges and gradients on outer peripheral elements was not sufficiently reliable. Introductory information is also given on BN-350 reactor as well as on some heat transfer problems. Orig. art. has: 3 diagrams and 10 graphs.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: NP

NO REF SOV: 000 OTHER: 000

Card 2/2

L 30391-66 EWT(l) IJP(c) CG/WW
ACC NR: AP6020792 SOURCE CODE: UR/0386/66/003/012/0471/0476

AUTHOR: Bespalov, V. I.; Talanov, V. I.

ORG: Scientific-Research Radiophysics Institute (Nauchno-issledovatel'skiy radiofizicheskiy institut)

TITLE: Filamentary structure of light beams in nonlinear liquids

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 12, 1966, 471-476

TOPIC TAGS: light transmission, light theory, light polarization, laser optics, laser modulation, LIQUID PROPERTY, PERTURBATION

ABSTRACT: The authors present a theory of formation of self-focusing light filaments in liquids, first described by Pilipetskiy and Rustamov (Pis'ma ZhETF v. 2, 88, 1965). It is shown that in a nonlinear dielectric, amplitude phase perturbations of a plane electromagnetic wave bring about its decay into individual beams having different self-focusing lengths, depending on the scale of the initial perturbation. In this case there exists a characteristic fastest-focusing scale, determined by the nonlinearity coefficient of the wave. The development of small perturbations of a plane wave into a decay is traced, and the stability of the

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ACC NR: AP6020792

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perturbations is analyzed. The buildup of the instability caused by these perturbations is shown to depend on the width of the initial perturbation region, on the anisotropy caused by the incident wave, and on the random inhomogeneities of the medium in which the wave propagates. The results are of importance in connection with possible structural changes that can occur in the field radiated by a laser, especially if the effect of nonlinearity of the active medium is aggravated by the presence of other nonlinear materials in the cavity (such as a saturating shutter). The authors thank A. V. Gaponov and M. A. Miller for a discussion of the results and V. N. Gol'dberg and R. E. Erm for the electronic computer calculations. Orig. art. has: 2 figures and 6 formulas. [02]

SUB CODE: 20/ SUBM DATE: 12Apr66/ ORIG REF: 006/ OTH REF: 004/
ATD PRESS: 5017

Card 2/2

L 31125-66

ACC NR: AP6011396 SOURCE CODE: UR/0057/66/036/003/0497/0507

AUTHOR: Averbakh, V. S.; Vlasov, S. N.; Talanov, V. I.

47
B

ORG: Scientific-Research Radiophysics Institute at the Gor'kiy State University im. N. I. Lobachevskiy (Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom gosudarstvennom universitete)

TITLE: An open resonator with an arbitrarily located stop

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 3, 1966, 497-507

TOPIC TAGS: laser, laser theory, resonator, electromagnetic field

ABSTRACT: The authors consider the normal modes and losses in an open resonator consisting of two spherical mirrors with a single beam-limiting diaphragm located at an arbitrary position on the optical axis. Such a resonator is regarded as a model of a laser with external mirrors in which the beam is limited by the dimensions of the working medium. All dimensions are assumed to be sufficiently large so that geometrical optics can be employed. The conditions for focusing are specified by the two parameters $g_i = 1 - L/R_i$ $(i = 1, 2)$, where L is the distance between the mirrors and R_i is the radius of curvature of the i-th mirror. The effect of misalignment of the mirrors is taken into account. Two types of diaphragm are considered: a perfectly transparent rectangular aperture, and an absorbing aperture in which the transmission is a Gaussian function of the distance from the axis. The basic equations are taken

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Card 1/2 UDC: 538.565

L 37936-66

ACC NR: AP6014253 SOURCE CODE: UR/0109/66/011/005/0943/0945

AUTHOR: Averbakh, V. S.; Vlasov, S. N.; Talanov, V. I.

ORG: none

14
B

TITLE: Nonaxial-mode discrimination in open quasi-optical systems

SOURCE: Radiotekhnika i elektronika, v. 11, no. 5, 1966, 943-945

TOPIC TAGS: mode discrimination, quasioptic system, millimeter wave, resonator

ABSTRACT: A highly mode-selective open-resonator system is considered. If the dimensions of a two-concave-mirror system are so proportioned that the caustic surfaces are formed only for the dominant (axial) mode, only this mode will be located near the system axis. Or else: any infinite-nonplanar-mirror resonator can be conformally mapped into a plane-parallel system filled with a nonhomogeneous dielectric. These considerations were verified by a numerical solution of an integral equation that described the field in a two-dimensional resonator; selectivity curves are shown. A qualitative corroboration was obtained from an experimental study of a resonator with 200-mm diameter mirrors operating at an 8-mm wavelength. "The authors wish to thank L. V. Piskunova and V. F. Morozov for their work on an electronic computer." Orig. art. has: 3 figures and 1 formula.

SUB CODE: 20, 09 / SUBM DATE: 16Aug65 / ORIG REF: 004

Card 1/1 JLS UDC: 621.372.4

TALANOV, V.I.

3

1-4E4c

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Electromagnetic Surface Waves Guided by a Boundary with Small Curvature.—M. A. Miller & V. I. Talanov. (Zh. tekh. Fiz., Dec. 1956, Vol. 26, No. 12, pp. 2755-2765.) The theory developed indicates the existence of (a) three-dimensional surface waves which maintain their surface characteristics independent of the radius of curvature, and (b) two-dimensional waves which are partly radiated even at small curvatures of the boundary. Curves showing the decrease of the attenuation of the latter type of wave with the increase in wave retardation and with the decrease in the curvature of the guiding surface are given. Several surface waveguides are illustrated.

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SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1832
AUTHOR MILLER,M.A., TALANOV,V.I.
TITLE Electromagnetic Surface Waves directioned by a Boundary with a Slight Curvature.
PERIODICAL Žurn.techn.fis, 26, fasc.12, 2755-2765 (1956)
Issued: 1 / 1957

In the paper by the same authors, Zurn.techn.fis.25, fasc.11, 1810 (1955) the properties of electromagnetic surface waves directioned by flat boundaries were investigated. This problem may be looked upon as a limiting case of the problem concerning waves directioned by a cylinder (in the case of an infinite value of the ratio between the cylinder radius r_1 and the wave length λ). The present work aims at investigating this boundary transition more closely than had been the case in the previous work. It was furthermore important to evaluate the distortions which were carried into the surface field (in the case of high but finite values of the curvature radius of the directioning boundary). Apart from the practical point of view, this is of interest also as a matter of principle, because there exists a certain class of waves which in the vicinity of a directioning boundary lose their surface character even if the curvature be ever so small. At first the equation for the wave numbers is set up. For this purpose a cylinder with any radius $r=r_1$, on the surface of which homogeneous boundary conditions prevail, is investigated. The problem consists in finding the radicals of the equations which were set up. With any value of the parameter $p=kr_1$ these equations can be solved only numerically; if $p_1 = kr_1 \gg 1$ ($r_1 \gg \lambda$) is

AUTHOR : Talanov, V.I.

"A Method Solving the Problem of Excitation of Surface Waves Over and Impedance Surface,"
A-U Sci Conf dedicated to "Radio Day," Moscow, 20-25 May 1957.

PERIODICAL: Radiotekhnika i Elektronika, Vol. 2, No. 9, pp. 1221-1224, 1957, (USSR)

[illegible]

[illegible], "On electromagnetic wave reflection from a plane with variable surface impedance." Scientific Session Devoted to "Radio Day", May 1956, Trudrezervizdat, Moscow, 9 Sep. 56

The problem is analyzed of the reflection of two-dimensional electromagnetic waves from a plane whose surface impedance is given as

$$Z(z) = \frac{P_m(z)}{P_n(z)}$$

where z is a coordinate on the plane, $P_m(z)$ is a polynomial of degree m with complex coefficients.

It is shown that the function $\Phi(h)$, conjugate to the Fourier function $\Psi(z)$ of the field distribution on the plane, satisfies an ordinary differential equation with cariable coefficients under certain additional assumptions.

The case of a fractional-linear dependence of $Z(x)$ is investigated, hence, a rigorous expression for the reflected field is obtained. The field of a given linear source above the plane is computed in the case of a linear dependence of $Z(z)$.

TALANOV, V. I.

V. I. TALANOV, "On electromagnetic wave diffraction on a surface impedance step in a waveguide." Scientific Session Devoted to "Radio Day", May 1958, Trudrezervizdat, Moscow, 9 Sep. 58

An exact solution is obtained of the problem of two-dimensional electromagnetic wave diffraction on a surface impedance step in a waveguide formed by two parallel planes, an impedance and a perfectly conducting. Expressions are presented for the fields the reflection and transformation coefficients. A generalization is made to the three-dimensional field case.

TALANOV, V.I.

Diffraction of electromagnetic waves by surface impedance shelves in wave guides. Izv.vys.ucheb.zav.; radiofiz. 1 no.3:64-72 '58. (MIRA 12:1)

1. Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete.
(Radio waves--Diffraction) (Wave guides)

"The Influence of Random Errors in the Source Distribution on the Radiation Pattern of Traveling Wave Antennas."

The author showed that, in case of continuous and also in case of discrete radiation element distribution, phase speed deviations of a wave at an antenna, limit the maximum possible gain of the latter when increasing its length. For the second case, ~~xxxx~~ current correlation functions in radiators were found, with consideration of their mutual influences, caused by the principal wave in the line. Finally, expressions for the average antenna radiation pattern were presented.

report presented at the All-Union Conference on Statistical Radio Physics, Gor'kiy, 13-18 October 1958. (Izv. vyssh uchev zaved-Radiotekh., vol. 2, No. 1, pp 121-127) COMPLETE card under SIFOROV, V. I.)

AUTHOR: Talanov, V. I. 57-28-6-23/34

TITLE: The Excitation of Surface Waves by the Open End of a Plane Waveguide (Vozbuzhdeniye poverkhnostnykh voln otkrytym kontsom ploskogo volnovoda)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 6, pp. 1275 - 1285 (USSR)

ABSTRACT: The present paper solves the problem of the diffraction of electromagnetic waves on the open end of a plane waveguide located above the moderating structure by the method of functional equations. It was assumed that the latter was extended to the interior of the waveguide. The following formulae were determined: 1) A formula for the field of the surface wave. In practical calculations formula (3.15) can be used with sufficient accuracy at any values of D:

$$T = 2 \operatorname{sh} \bar{p}_0 \operatorname{th} \bar{p}_0 e^{-q} \frac{2\Gamma_0 \Gamma_0 + D}{\Gamma_0 + \Gamma_s \Gamma_s + D} e^{-(\Gamma_0 - \Gamma_s)} \qquad (3.15)$$

Card 1/4 2) A formula for the radiation field. At $Q_1 = 0$ the formula for the

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radiation diagram of the open end of the flat waveguide of an ideally conductive lower wall is obtained (Reference 3)

$$W(\theta) \sim \frac{\sin (D \sin \theta)}{\sin \theta} e^{D \cos\theta} \qquad (3.20)$$

3) Formulae for the waves within the waveguide, which are reflected from its open end. From a comparison between the formulae

$$|R_o|^2 = \left(\frac{\Gamma_o + D}{\Gamma_s + \Gamma_o} \right)^2 \frac{1}{ch^2 \bar{p}_o} e^{-2\Gamma_o} \qquad (3.21)$$

and $$|R_o|^2 = e^{-2D}$$

it may be seen that, in the first case, with a fixed Q_1, the reflection coefficient decreases considerably more rapidly with an increase of D than in the second case. These results are obvious and can be explained by the fact that in a waveguide with an impedance base the field closely adjoins the latter.

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Therefore the excitation caused by the upper wall manifests itself comparatively little. Thus, in the case of the excitation of surface waves by the open end of a waveguide and if the moderating system has been extended into the interior of the waveguide the degree of excitation of the wave is determined by the amount of moderation and by the position of the upper wall of the semiconductor. It will be all the stronger the more open the waveguide will be in the case of a suitable moderation.In practice, it is not advisable to choose a very large opening for the semiconductor because of the possible occurence of propagating higher types of waves in connection with the excitation of the waveguide. If the fields of the highest types are known, the corresponding coefficients of their transformation into surface - or space waves can also be calculated according to the general formulae. The results of this work may prove useful in the course of the technical investigation of the antennae for surface waves. The author thanks M. A. Miller and A. V. Gaponov for their discussion

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of results. There are 7 figures and 5 references, 3 of which are Soviet.

ASSOCIATION: Gor'kovskiy gosudarstvennyy universitet im. N. I. Lobachevskogo (Gor'kiy State University imeni N. I. Lobachevskiy)

SUBMITTED: July 22, 1957

1. Electromagnetic waves--Diffraction 2. Electromagnetic waves--Mathematical analysis 3. Waveguides--Mathematical analysis 4. Electromagnetic waves--Excitation

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TALANOV, V. I., Candidate Phys-Math Sci (diss) -- "Some problems of diffraction and excitation of electromagnetic waves in decelerating systems". Gor'kiy, 1959. 9 pp (Min Higher Educ USSR, Gor'kiy State U im N. I. Lobachevskiy), 150 copies (KL, No 25, 1959, 127)

06344
SOV/141-2-1-16/19

AUTHOR: Talanov, V.I.

TITLE: Electromagnetic Surface Waves in Systems with Non-uniform Impedances

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 1, pp 132 - 133 (USSR)

ABSTRACT: It is known (M.A. Miller - Ref 1) that non-uniformity in surface impedance can generally lead to conversion of energy from a guided to a radiated form. There are also cases where surface waves can also exist, analogous to the uniform-impedance types but orthogonal to them. The example considered is a two-dimensional wave confined between two planes at an angle $0 < \varphi_0 \leqslant 2\pi$. If, in cylindrical coordinates the surface impedances are inverse functions of r then the solution to the wave equation is Eq (1) in terms of Hankel functions whose order is found from the characteristic Eq (2). The asymptotic form of the solution for large r is Eq (4). This form of geometry offers the simplest model and enables an aerial aperture to be designed in the same way as for an ordinary horn.

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Electromagnetic Surface Waves in Systems with Non-uniform Impedances

There are 3 references, 2 of which are Soviet and 1 English.

ASSOCIATION: Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Radiophysics Research Institute of Gor'kiy University)

SUBMITTED: December 17, 1958

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SOV/141-2-3-13/26

AUTHORS: Talanov, V.I. and Sheronova, N.M.

TITLE: The Influence of Random Errors in the Distribution of Sources on the Radiation Patterns of Travelling-wave Aerials 25

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 3, pp 424 - 430 (USSR)

ABSTRACT: Expressions are obtained for the deviation of the mean diagram from its nominal value caused by random perturbations in amplitude, phase and phase velocity of the current waves in the aerial. It is shown that errors in phase velocity limit the possibilities of obtaining highly-directive patterns by increasing dimensions. The analogous problem for lenses and mirror aerials has been treated earlier (Refs 1-5). In a progressive-wave aerial the pattern is influenced by errors in the feeder and in the radiating elements themselves. The effects are more serious than in lenses and mirrors since the influence is not merely local but can affect even those parts of the structure which are otherwise perfect. The

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example is taken of a linear aerial whose parameters are slowly varying functions of the coordinate z, the source distribution being Eq (1). The radiation pattern (in power) of an aerial of length $2L$, with this distribution, is given in Eq (2). The deviation in the pattern caused by random errors in current distribution is given by Φ_{pac}, the "scattered power", in Eq (6) where $K(z,z')$ is the autocorrelation function. It is reckoned that the dimensions of the irregularities in the feeder are large compared with the wavelength. The amplitude and phase components of error are given by Eqs (8) and (9), respectively. The latter equation may be considered in two forms, referring to local phase errors, Eq (10), and non-local phase errors, Eq (11). The effects of these errors on the diagram are calculated on the assumption that they are uncorrelated. The relevant correlation functions are Eqs (12), (13) and (14). For amplitude errors the scattered power is Eq (15), where the function $f(t, \xi)$ is given in

Card 2/4 Figure 1. For a given length and mean dispersion the

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scattered power and the directivity increase with the radius of correlation. The diagram remains symmetrical. The relative distortion of the diagram is inversely proportional to L for a fixed error. The corresponding equation for local phase error is Eq (16) and the conclusions are similar. For non-local phase error the scattered power is Eq (20), the associated function being plotted in Figure 2, in two parts. One part, $f_1(\xi)$, is negative and thus adversely affects the pattern. The scattered power is a cubic function of L and thus increases faster than the nominal power in the diagram. There would therefore seem to be a maximum useful size of aerial limited by errors in phase velocity. The limiting length $L_{пред}$ is given on p 429. A lugger aerial has a poorer performance. At X-band frequencies, with 0.05 mm tolerances and correlation radius of $10\lambda_c$, the maximum aerial size (for this form of aerial) would be ~35 m.

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The Influence of Random Errors in the Distribution of Sources on the Radiation Patterns of Travelling-wave Aerials

There are 2 figures and 8 references, 4 of which are Soviet, 2 English, 1 French and 1 Italian.

ASSOCIATION: Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Radiophysics Research Institute of Gor'kiy University)

SUBMITTED: March 2, 1959

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AUTHOR: Talanov, V.I.

TITLE: The Excitation of Dielectric Waveguides 25

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 6, pp 902 - 910 (USSR)

ABSTRACT: The system considered is illustrated diagrammatically in Figure 1. A dielectric plate having a thickness d and parameters ε_1 and μ_1 is situated on an ideally conducting plane x = 0 . The exciting waveguide is formed by the plane x = 0 and an ideally conducting semi-plane x = d , which is situated directly above the dielectric plate. An ideally conducting screening sheet is situated at a distance D from the plane x = 0(x = D > d) . By considering only the H-waves, the diffraction current $I_z = I(z)$, excited by the incident wave in the semi-plane x = d , is expressed by:

$$I(z) = \int_{-\infty}^{\infty} F(h) e^{-ihz} dh \qquad (1.1)$$

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The component H_y of the magnetic field of this current in the dielectric and above the dielectric is described by Eq (1.3) and Eq (1.4). The remaining parameters of Eq (1.2) are defined by Eq (1.5). The function F(h) of Eq (1.1) can be found from the system of integral formulae defined by Eq (1.6), where I_n is the current amplitude at the plane x = d . The functions L(h) are defined by Eqs (1.7) - (1.10). Consequently, the solution of Eqs (1.6) is in the form of Eq (1.12). If equations of the type (1.8), (1.9) and (1.10) are equated to 0 , they are equivalent to Eqs (2.1), (2.2) and (2.3). The solutions of Eqs (2.1) and (2.2) are in the form of Eqs (2.4) and (2.5). Eqs (2.1), (2.2) and (2.3), together with Eq (1.5) determine the propagation constants of the proper waves in regular waveguides (Regions 1, 2 and 3 in Figure 1). The H_y components of the free waves in these waveguides (see Figure 1) are expressed by Eq (2.7). If the field components are normalized in accordance with Eq (2.8), their amplitudes are expressed by Eq (2.10). In

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The Excitation of Dielectric Waveguides

order to determine the auxiliary functions L_1 and L_2 it is necessary to consider separately each factor in the expression for L(h) (see Eq 1.11). The auxiliary functions can then be expressed by Eq (3.6). By substituting the solution for the function F(h) into Eq (1.2), it can be seen that the unique particular points of the sub-integral expressions in Eq (1.2) are the simple poles in the roots of the characteristic Equations (2.1) - (2.3). On the basis of the Cauchy theorem the fields in the waveguides 1, 2, 3 (Figure 1) are given by Eqs (4.4) - (4.6). The transformation coefficients T can be expressed by Eqs (4.7). Figure 4 shows the dependence of the square of the modulus of the transformation coefficient T_{oo} on $\xi = (D - d)/d$. Figure 4 shows also the reflection coefficients R_{oo}. The same quantities can also describe the system represented in Figure 5a, where a flat dielectric waveguide, having a

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thickness 2d is excited by a screened waveguide. The Eq (4.7) can therefore be employed for an approximate evaluation of the excitation of opened dielectric waveguides. The above method of analysis can also be used in the evaluation of the excitation of slow H-waves in a general case, when the upper wall of the exciting waveguide is fitted above the surface of the dielectric plate. The problem of the E-wave can be solved in a similar manner. There are 5 figures and 8 references, 3 of which are English and 5 Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific-research Radiophysics Institute of Gor'kiy University)

SUBMITTED: June 13, 1959

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AUTHOR: Talanov, V.I.

TITLE: Radiation of Surface-wave Antennae With Periodically Changing Surface Impedance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol. 3, No. 5, pp. 802 - 817

TEXT: The characteristics of two-dimensional TM-waves of the surface type are considered. The waves propagate over an impedance plane (Fig. 1) which is characterised by the following boundary condition:

$$E_z = Z(z)H_y \qquad (1.1)$$

and has a purely reactive surface impedance expressed by:

$$Z(z) = iZ_o(Q_o + Q_1 \sin(\beta kz)) \quad (\mathrm{Re}\ Z = 0) \qquad (1.2)$$

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where Q_o and Q_1 are positive constants;

$\beta = 2\pi/kD$,
$Z_o = \sqrt{\mu_o/\varepsilon_o}$;
$k = \omega\sqrt{\varepsilon_o \mu_o} = 2\pi/\lambda$;

D is the modulation period of the impedance, while

ε_o; μ_o are the parameters of the medium occupying the semispace $x > 0$.

The components of the magnetic field $H_y \equiv H$, which can be used to express the remaining components of the field, can be written as an infinite sum of spatial harmonics:

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$$H(x, z) = \sum_{n=-\infty}^{\infty} a_n e^{-ih_n z - i\varkappa_n x} \qquad (1.3)$$

where h_n and $\varkappa_n$ are defined by Eqs. (1.4). On the basis of Eqs. (1.3) and (1.1), it is found that the amplitude a_n of the spatial harmonics can be found from an infinite system of equations; this is represented by Eq. (1.5), where various symbols are defined by Eqs. (1.6). Eqs. (1.5) can be written in the form of recurrence equations (1.7), where T_n is defined by Eq. (1.8). From Eq. (1.7) it follows that the asymptotic value of T_n is given by Eqs. (1.9). The recurrence relations can also be represented by continuous fractions, these are defined by Eqs. (1.11). From Eqs. (1.11) it is found that for $m \to \infty$, the characteristic equation for determining the wave number γ_o for the zero harmonic

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is given by Eq. (1.12), where $\xi = B^2$ and n is an integer. If γ_o is regarded as that value of the root at which for $\xi \to 0$, $\gamma_o = \gamma_s = \sqrt{1 + Q_o^2}$, Eq. (1.12) can be written as Eq. (1.13) provided n = 0. Eq. (1.13) can be solved by the method of successive approximations. For $\xi \ll 1$ (low modulation) the zero and the first approximations for Eq. (1.13) are given by Eqs. (1.14) and (1.15). The expressions for γ_o are therefore in the form of Eqs. (1.16) and (1.17), where $\sigma_o^{(1)}$ is defined by Eq. (1.18). In general, $\gamma_o^{(1)}$ can have a real and imaginary component as defined by Eq. (1.19). These components can be evaluated from Eqs. (1.20) and (1.21). The functions F and G in these equations are plotted in Figs. 2 and 3. It is of interest to investigate the field in the system in the

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vicinity of the critical frequencies of π- and 2π-oscillations. The oscillations of the π-type obey the conditions of Eq. (1.23). The characteristic equation which determines the frequencies of π-oscillations is in the form of Eq. (1.26). The oscillations of 2π-type obey the relationships expressed by Eq. (1.32) and the characteristic equation for determining the critical frequencies of these oscillations is in the form of Eq. (1.34). Eqs. (1.21) for this case can be written as Eqs. (1.39) and (1.40). The above results can be used to analyse a two-dimensional radiation source which is in the form of a section of impedance plane $0 \gtrsim z \gg E$ and has a sinusoidally varying surface impedance. It is assumed that a surface wave propagating in the +z-direction is generated at the radiator. If the region of the parameters lying in the vicinity of 2π-oscillations is neglected, the distribution of the equivalent sources at the radiating antenna can be described by:

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$$\Phi(z) = \sqrt{\xi} \exp(-i\gamma_{-1r}kz - \gamma_{0im}kz) \qquad (2.1)$$

where γ_{-1r} and γ_{0im} are determined from Eqs. (1.20) and (1.21). If Q_1 changes comparatively slowly, Eq. (2.1) can be written as Eq. (2.2), where various parameters are defined by Eqs. (2.3). The amplitude distribution is assumed to be in the form of Eq. (2.4). If the function A(z) in Eq. (2.4) is given, this represents an equation with respect to $\xi(z)$ and its solution is in the form of Eq. (2.5). Now, the source distribution function can be expressed by Eq. (2.6), where $\psi(z)$ is defined by Eq. (2.7). The maximum phase distortion of the antenna

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occurring at $z = L$ is defined by Eq. (2.8) and the efficiency of the antenna is expressed by Eq. (2.9). If the amplitude has a uniform distribution, it is shown that the modulation law of the impedance should be in the form of Eq. (2.11), where η is expressed by Eq. (2.12). The dependence of ξ/ξ_0 on z/L (see Eq. 2.11) for various values of η is illustrated in Fig. 4. The sinusoidal amplitude distribution can be secured if the impedance modulation function is in the form of Eq. (2.13), where $\eta = kGA_o^2L$. Graphs of this modulation function for various values of η are shown in Fig. 5. The above analysis does not take into account the absorption of the surface-wave energy. This can be taken into account by assuming that the wave damping coefficient $k\delta$, which is due to the energy dissipation in the slow-wave system, is independent of the

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depth of the modulation and is solely determined by the values of the parameters of the system. In this case, the distribution of the first spatial harmonic along the antennae can be described by Eq. (2.14). The impedance modulation $\xi(z)$ is now given by Eq. (2.15) and the phase distortion is expressed by Eq. (2.16). In this case, the modulation function for a uniform amplitude distribution is represented by Eq. (2.20) and the limiting value of the antenna efficiency is given by Eq. (2.21). This equation is plotted in Fig. 6. The modulation function of Eq. (2.20) is plotted in Fig. 7. From the above analysis it is seen that by using the method of spatial harmonics for the solution of the problem of the surface-wave propagation above a plane with sinusoidally varying surface impedance it is possible to determine all the formulae necessary for evaluating the amplitude-phase distributions of the field in antennae with surface waves. Analogous

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procedures can be applied to the evaluation of the fields in cylindrical antennae with periodically varying parameters. After submission of the paper to the editor the author was informed by A.A. Oliner that a similar problem was investigated by him with A. Hessel and the results obtained were presented at a symposium on electromagnetic theory in Toronto in June, 1959. The author points out that, unfortunately, he could not become acquainted with the material of this symposium until after the proof-reading of his paper. There are 7 figures, 3 references: 1 English, 1 French and 1 Soviet.

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E039/E135

AUTHORS: Miller, M.A., and Talanov, V.I.

TITLE: The use of the surface impedance concept in surface electromagnetic wave theory. (Review)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.4, no.5, 1961, 795-830

TEXT: This is a comprehensive review paper which deals with some general questions on the way in which the theory of surface electromagnetic waves is related to impedance and on the guiding properties of boundaries. It is assumed that in the general case surface impedance may possess spatial dispersion. The value of this in the study of free waves, as well as for the solution of the problem of surface field excitation by means of various sources is shown. The work is discussed under four main headings, as follows.

1. Free surface waves. This section is divided into ten parts and starts with a discussion on surface impedance. In the case of a closed boundary surface the tangential form of the vector field is given as

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$$\underline{E}_i = \sum_{k=1}^{2} Z_{ik} \left[\underline{nH}\right]_k \qquad (1.1)$$

where $\underline{n}$ is normal to the surface, ik is the characteristic index of orthogonal coordinates in the direction of the surface. The tensor $Z_{ik} = R_{ik} + jX_{ik}$ in a practical rationalised system of units (used in this survey) has the dimensions of impedance and is called the surface impedance tensor. It is shown that surface waves guided by a plane boundary become plane heterogeneous waves and, for cylindrical surfaces, cylindrical heterogeneous waves. A large part of the work on surface waves is devoted to the guiding properties of surfaces. The basic properties of surface waves are discussed in detail. Briefly the condition for the existence of surface waves near a plane z = 0 leads to the relation:

$$\mathrm{Re}\,\gamma = -\,\mathrm{Im}\,\gamma > 0 \qquad (1.17)$$

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The phase velocity of such waves is always less than the velocity of propagation (for a two dimensional plane the velocity of light $c = 1/\sqrt{\varepsilon\mu}$). Discarding non-essentials the solution of the equation for local fields for $\tilde{\gamma}^2 = -1$ gives:

$$\tilde{\gamma}_{\pm} = \tilde{M} \pm \sqrt{\tilde{M}^2 + N} \qquad (1.15)$$

If $\tilde{M}$ and N are considered real it is comparatively simple to classify all possible forms of surface waves. Fig.1 shows five different regions for the parameters $\tilde{M}$ and N. In the first three the condition (1.13) is satisfied. In region I ($N > 0$) there is only one positive root ($\tilde{\gamma}_+ > 0$; $\tilde{\gamma}_- < 0$) and only one type of surface wave is possible. In region II, ($\tilde{M}^2 > -N$, $N < 0$, $\tilde{M} > 0$) the simultaneous existence of two propagated waves is permitted. In region III ($\tilde{M}^2 < -N$, $N < 0$, $\tilde{M} > 0$) there are two complex roots with positive real parts. The regions IV and V correspond to the propagation of non-localised fields. In IV ($\tilde{M} < -N$, $N < 0$, $\tilde{M} < 0$)

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both roots of Eq (1.15) are complex, and in V ($\tilde{M} > -N$, $N < 0$, $\tilde{M} < 0$) real and negative. This illustrates the possible forms of surface waves and shows the critical values of parameters appropriate to transitions from one region to another. The review continues with a discussion on surface impedance at a plane boundary and on systems with cylindrical boundaries. The latter condition is qualitatively analogous to the plane boundary case. The case of surface waves on a heterogeneous boundary is considered and it is shown that for the general case one must resort to an approximate method. This section is concluded by a consideration of the effect of a boundary with a sinusoidal change of impedance.

2. The excitation of surface waves by an external source.
The question of excitation by an external source situated near a dividing boundary is the subject of a whole series of papers. Surface fields are in principle analogous to comparatively simple problems such as the determination of fields inside a screened transmission line: hence one is able to use well developed wave theory methods. In practice a real source will excite a whole

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complex of other fields apart from the surface fields, forming the so-called spatial waves weakly coupled to the guiding boundary.
3. The diffraction of surface waves. This question is discussed in detail under a number of headings. It is shown that, as with the study of free surface waves, the use of the impedance approach is extremely effective. This permits the use of a series of simple models for the elucidation of the basic characteristics of practical systems.
4. Antenna systems. It is shown that one of the most useful applications of the impedance approach is in the design of antenna systems.
M.C. Neyman, G.D. Malyuzhinets, M.D. Khaskind, B.Ya. Moyzhes, L.A. Vaynshteyn, Kuan-Ting-Hua, P.S. Mukazan and V.I. Bespalov are mentioned in the article in connection with their contributions in this field.
There are 5 figures and 227 references: 89 Soviet-bloc, 2 Russian translations from non-Soviet-bloc publications, and 138 non-Soviet-bloc. The four most recent English language references read as follows:

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The use of the surface impedance ... S/141/61/004/005/001/021
E039/E135

Ref. 18 A. F. Harvey. IRE Trans., v.MTT-8, 30 (1960).
Ref. 20. F. J. Zucker. Handbook of Antenna Engineering. H. Jasik McGraw-Hill Book Co., 1960.
Ref. 21. F. J. Zucker. J.Res. NBS, v.64D, 6 (1960).
Ref. 22. A.D. Bresler, IRE Trans., v.MTT-8, 81 (1960).

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete
(Scientific Research Institute of Radiophysics at Gor'kiy University)

SUBMITTED: June 27, 1961

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33223
S/141/61/004/006/010/017
E192/E382

9,1000 (1159)

AUTHOR: Talanov, V.I.

TITLE: Radiation of the sources situated above a plane with sinusoidally-modulated surface impedance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.4, no. 6, 1065 - 1076 1961

TEXT: The aim of the paper is to investigate the field produced by simple sources placed above a plane with a periodically changing impedance in order to elucidate the mechanism of excitation of surface and quasi-surface fields and the role of these fields in determining the directional patterns of given sources. The system considered is illustrated in Fig. 1, where a magnetic-current filament I^m passes through the point $x = H$, $z = z_0$ and is parallel to the axis y. The plane $x = 0$ is characterized by the boundary condition

$$E_z = Z(z)H_y \tag{1.1}$$

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where

$$Z(z) = iZ_o \left[Q_o + Q_1 \sin(\beta\, kz) \right] \quad (\mathrm{Re}\ Z = 0) ;$$

$$Z_o = \sqrt{\mu/\varepsilon}, \quad k = \omega\sqrt{\varepsilon\mu}; \quad \beta = 2\pi/kD ,$$

The field excited by such a source can be represented as a sum of the primary field

$$H_{\Gamma} = \frac{\omega\varepsilon I^m}{4\pi} \int_{-\infty}^{\infty} e^{-i\varkappa|x-H|-ih(z-z_o)} \frac{dh}{\varkappa} \qquad (1.2)$$

where $\varkappa = \sqrt{k^2 - h^2}$ and a secondary field H_B which is dependent on the influence of the impedance plane on the field H_{Γ}. The secondary field can be represented in the form

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Radiation of the sources ...

$$H_B = \int_{-\infty}^{\infty} \sum_{n=-\infty}^{\infty} a_n(h) e^{-ih_n z - i\varkappa_n x} dh \qquad (1.3)$$

by taking into account the periodic structure of the boundary conditions on the plane $x = 0$. In Eq (1.3)

$h_n = h + k\beta n$; $h_o = h$; $\varkappa_n = \sqrt{k^2 - h_n^2}$.

The fields expressed by Eq. (1.2) and (1.3) will satisfy the radiation principle for $x \to \infty$ if the signs of the square roots in the epxressions for $\varkappa_n$ for all n are chosen so that the following condition is met:

$$\operatorname{Im} \varkappa_n < 0 \qquad (1.4)$$

This is necessary for the convergence of the integrals. The integration contour in Eqs. (1.2) and (1.3) lies on the real axis, where the branching points of the sub-integral

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Radiation of the sources S/141/61/004/006/010/017
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functions are also situated. These are determined by the condition

$$\varkappa_m = 0$$

The equations for the amplitudes of the spatial harmonics $a_n(h)$ can be obtained by substituting the sum of the fields H_i and H_B into the boundary conditions given by Eq. (1.1) and equating to zero the coefficients with the functions $e^{-ih_n z}$ $(n = 0, \pm 1, \pm 2, ...)$ The overall field can be expressed by

$$H = H_i + H_{B_0} + \sum_{n=0}^{\infty} H_{B_n} + \sum_{n=0}^{\infty} H_{B_{-n}} \tag{1.14}$$

Detailed expressions for all the components in Eq. (1.14) are given. These are used to evaluate the field of the surface wave $H^{(s)}$ The radiation field (at a comparatively great

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distance) is also evaluated and it is shown that this is in the form:

$$H^{(r)} = \frac{\omega \varepsilon I^{m}}{2\ 2} \frac{e^{-i(kR- /4)}}{kR} \ (h_o) e^{ih_o z_o} \qquad (3.2)$$

where (h_o) represents the directional pattern of the system. The expression for (h) is used to plot as a function of γ_o = cos ; The symbols R and in Eq. (3.2) denote the cylindrical coordinates. It is found from the graphs that the formation of highly directional radiation patterns by means of periodically-modulated impedance structures with suitably chosen parameters is due to the generation of localized surface or quasi-surface waves in the vicinity of these structures. It is therefore possible to use the expressions for the surface fields $H^{(s)}$ for determining the directional patterns not only of the localized surface waves

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0"

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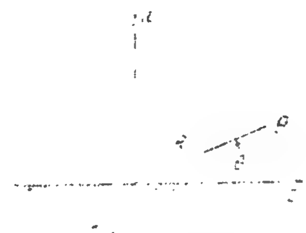
Radiation of the sources ....

but also in the case of quasi-surface waves which cannot be excited (in pure form) under any realistic conditions. There are 3 figures and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The two English-language references mentioned are: Ref. 2: L.O. Goldstone, A.A. Oliney - IRE Trans., AP-7, 4, 307, 1959; Ref. 4: A.L. Cullen, Proc. IEE, p. 4, 101, 225, 1954.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Radiophysics Institute of Gor'kiy University)

SUBMITTED: March 24, 1961

Fig. 1:



Card 6/6

BUTYRSKIY, I.I., inzh.; TALANOV, V.I., starshiy elektromekhanik

Vehicle-mounted reel attachment for winding wires. Avtom., telem. i sviaz' 5 no.5:28 My '61. (MIRA 14:6)

1. Charskaya distantsiya signalizatsii i svyazi Kazakhskoy dorogi (for Butyrskiy).
(Electric lines—Poles)

41406
S/141/62/005/004/004/009
E192/E382

24.2500

AUTHOR: Talanov, V.I.

TITLE: Field above a plane with nonhomogeneous surface impedance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v. 5, no. 4, 1962, 721 - 735

TEXT: The paper was first read at the Scientific Session of NTO im. A.S. Popov in Moscow in 1958. Some problems of electrodynamics and acoustics relating to the field of given sources, situated above a plane, having a surface impedance $q(y, z)$, can be solved by finding the solution of the wave equation:

$$\Delta\psi + k^2\psi = -f \qquad (1.1)$$

which satisfies the radiation condition at infinity and the boundary condition:

$$\frac{\partial\psi}{\partial x} + kq(y, z)\psi = 0 \qquad (1.2)$$

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at the plane $x = 0$ (see Fig. 1). In the above $\psi(x, y, z)$ is a scalar function describing the field, $f(x, y, z)$ is a function characterising the distribution density of the sources, and $k = 2\pi/\lambda_0$, where λ_0 is the wavelength in the medium. It can be shown that Eq. (1.1) leads to the following integral:

$$\psi(\underline{\rho}) = \psi_0(\underline{\rho}) + \frac{k}{4\pi}\int\left[q(\underline{\rho}') - \alpha\right]\psi(0, \underline{\rho}')G(0,\underline{\rho},0,\underline{\rho}')\, ds' \quad (1.7)$$

where:

$$\psi_0(\underline{\rho}) = \frac{1}{4\pi}\int_{V'} f(\underline{r}')G(0, \underline{\rho}, \underline{r}')dv' \quad (1.8)$$

in which $\underline{\rho}$ is the radius vector of the integration point on the plane $x = 0$ and ψ_0 is the field of the source $f(r)$ on the plane with a homogeneous impedance $q(\underline{\rho}) = \alpha$.

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Eqs. (1.7) and (1.8) are first employed to investigate the case of two-dimensional fields where the impedance is independent of the coordinate y and is a rational-fractional function of the type

$$q(z) = q_0 - \frac{p}{z - z_\infty} \qquad (2.1)$$

where q_0, p and z_∞ are constant parameters. The external field for the system is assumed to be in the form:

$$\Psi_n = e^{-ih_0 z + i\varkappa_0 x} \qquad (2.3)$$

and this wave impinges on the plane x = 0 at angle θ, so that:

$$h_0 = -k \sin\theta \qquad \varkappa_0 = k\cos\theta \qquad (2.4)$$

+

The function $\psi(x,z)$ is determined for the cases of $p < 0$ and $p > 0$. These formulae show that the field is formed by a superposition of plane waves in which the spectrum of the propagation constant λ is limited by the propogation constant λ_0 of the incident wave (from below for $p < 0$ and from above

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Field above a plane ....

for ρ 0). The reflected field is thus scattered in all directions contained in the angle between the mirror-reflected ray and the direction of the predominant impedance increase. The case when the impedance is a linear function given by:

$$q = q_I + p_1, z \qquad (2.22)$$

is also considered. The field in the vicinity of a plane with such a linear impedance is shown to consist of a field primarily dependent on the local reflection coefficients and a surface field which is different from zero only above those areas of the plane where the impedance is positive. The directional pattern of the sources situated above a plane whose impedance is in the form described by Eq. (2.1) is also determined and it is shown that the surface waves play a substantial part in determining the directivity. In particular, the surface fields determine the directivity of an isotropic radiator situated above a plane with a positive but monotonically decreasing surface impedance. There are 7 figures.

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Field above a plane S/141/62/005/004/004/009
E192/E382

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Radiophysics Institute of Gor'kiy University)

SUBMITTED: December 7, 1961

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Card 5/5

S/141/63/006/001/006/018
E140/E135

AUTHOR: Talanov V.I.

TITLE: On aperiodic solutions of the field equation at the edges of the passbands of sinusoidally modulated unshielded impedances

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.6, no.1, 1963, 65-73

TEXT: It is shown that at the edges of the passbands of unshielded sinusoidally modulated impedance structures, along with a periodic solution of the field equations, there exists for the surface wave an aperiodic solution analogous to the solution of a Mathieu equation. The practical interest of the problem is that it is possible to reduce to this the analysis of the operation of an antenna with periodically modulated surface impedance, radiating along the normal to the delay structure.
There are 3 figures.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Institute of Radiophysics at Gor'kiy University)

SUBMITTED: July 11, 1962

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L 10112-63
ACCESSION NR: AP3003399 S/0142/63/006/003/0308/0311

44

AUTHOR: Koshelev, V. V.; Talanov, V. I.

TITLE: Automatic optimization of ferrite switch characteristics

SOURCE: IVUZ. Radiotekhnika, v. 6, no. 3, 1963, 308-311

TOPIC TAGS: ferrite switch, automatic optimization

ABSTRACT: An optimum-seeking circuit is proposed for use with ferrite switches in microwave applications. The circuit is a feedback system which senses and corrects the magnetizing current for deviation of the optimum ferrite attenuation characteristic, due to incident r-f frequency drift, temperature effects on the ferrite, etc. This is done by superimposing a low frequency threshold signal on the d-c magnetizing current, such that with sufficient drop in ferrite attenuation this low frequency will appear as a modulation of the passed radio frequency. The latter is detected and any low-frequency modulation is recovered as an error signal, which is treated to return the d-c magnetizing current to the optimum value. The circuit uses a phase detector to give directionality to the error signal; the latter feeds to the grid of the output-controlled rectifier, whose load is the ferrite magnetizing coil. Operation with the automatic tuning described was

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ACCESSION NR: AP3003399

compared to operation without it in a two-channel system in the 3-cm band. The comparison showed that a normal channel isolation of 20--30 db is deteriorated on the average by only 3--4 db as a result of tuning circuit effects. In the experiment the emphasis was on qualitative results without striving for the best response time; e.g., the low-modulating frequency used (330 cps) resulted in a loop response of only 5 or 6 cps, which could be improved with higher modulating frequency and tighter loop response in general. A limitation cited is the minimum r-f power required for error detection, which precludes its use in some radar receiving modes. Orig. art. has: 4 figures.

ASSOCIATION: NIRFI pri gos. universitete im. N. I. Lobachevskogo (NIRFI at State University)

SUBMITTED: 07Feb62 DATE ACQ: 02Aug63 ENCL: 00

SUB CODE: 00 NO REF SOV: 002 OTHER: 000

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Card 2/2

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0"

S/0141/64/007/002/0313/0327

ACCESSION NR: AP4039732

AUTHOR: Bondarenko, N. G.; Talanov, V. I.

TITLE: Some aspects of the theory of quasi-optical systems

SOURCE: IVUZ. Radiofizika, v. 7, no. 2, 1964, 313-327

TOPIC TAGS: quasioptics, waveguide propagation, waveguide diffraction, mirror configuration, wave field, diffraction analysis

ABSTRACT: In order to find a unified approach to the analysis of quasi-optical systems, the diffusion approximation is used to describe wave beams in such systems and to determine the laws of conversion of wave beams by infinite-plane field transformers. Some general laws of propagation of wave beams are derived with the aid of wave beams and with the aid of geometrical optics, and it is shown that the problem of existence of stable (periodic) configuration of wave beams in a specified sequence of converters can be solved on the basis of a purely geometric analysis of the passage of a light beam through a system. A configuration of wave beams that ensures the transfer of energy between two specified apertures of converters with minimum losses is derived. The connection between such optimal configurations and the field distributions in beam waveguides and resonators is investigated.

Card 1/2

[illegible]

[illegible] electromagnetic pulses in [illegible] medium.
[illegible] radiofiz., [illegible] no. [illegible] 491-496 '64. [illegible]

[illegible] issledovatel'skiy radiofizicheskiy institut pri [illegible] [illegible]
[illegible]

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0"

L 08444-65 EWT(d)/EWT(l)/EWG(k)/EPA(sp)-2/EEC(k)-2/EEC-4/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWA(m)-2/EWA(h) Pn-4/Pz-6/Po-4/Pab-24/Pg-4/Pt-10/Pi-4/Pl-4 IJP(c)/AFETR/RAEM(a)/ASD(a)-5/AS(mp)-2/AFMD(t)/ESD(dp)/ESD(gs)/ESD(t)/RAEM(t)

ACCESSION NR: AP4044113 AT/WS S/0141/64/007/003/0564/0565

AUTHOR: Talanov, V. I. 134

TITLE: On the self focusing of electromagnetic waves in nonlinear media

SOURCE: IVUZ. Radiofizika, v. 7, no. 3, 1964, 564-565

TOPIC TAGS: waveguide propagation, plasma electromagnetic wave, electromagnetic wave focusing, transverse wave, dielectric constant, propagation constant

ABSTRACT: Using as an example an isothermal equilibrium hydrogen plasma in a monochromatic field, the author demonstrates that the action of a strong high frequency field on a plasma causes a redistribution of the electron and ion densities, in accordance with the field amplitude, and that this in turn can lead to self-focusing of the electromagnetic waves. Traveling two-dimensional TE waves are

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ACCESSION NR: AP4044113

considered in a medium having a dielectric constant given by

$$\varepsilon = \varepsilon_0[1 - q^2\exp(-|E/E_p|^2)]$$

(E -- electric field intensity). A characteristic equation is derived, relating the propagation constant with the field amplitude at the maximum of the wave. The condition under which the characteristic equation has a nontrivial solution is determined. The resultant field structure corresponds to the formation in the plasma of a waveguide channel maintained by the action of the field itself. The channel is produced for arbitrary wave power, the power level determining the effective width of the channel and the structure of the field in it. A similar analysis made for the case of TM waves in the same medium leads to solutions of the traveling-wave type with a field maximum in a finite region of space. Although the generalization to three-dimensional fields entails great difficulties, in some cases the variables can be separated and a solution ob-

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ACCESSION NR: AP4044113

tained. It is further shown that self-focusing waveguide channels can be induced by a high frequency field in an arbitrary isotropic medium, if it is assumed that the field produces an isothermal deformation that varies the density of the medium in proportion to the pressure. The effect of weak attenuation in the nonlinear medium on the shaping and structure of the self-focusing waveguide channels can be considered in limiting cases by the usual energy balance method. Orig. art. has: 9 formulas.

ASSOCIATION: None

SUBMITTED: 25Feb63 ENCL: 00

SUB CODE: EC, ME NR REF SOV: 002 OTHER: 001

Card 3/3

MILOVSKIY, N.D.; TALANOV, V.I.

Accuracy limit in measuring the angular coordinates of a source using multielement antennas. Radiotekh. i elektron. 9 no.9:1605-1610 S '64. (MIRA 17:10)

ACCESSION NR. AP4031189 S/0056/64/046/004/1500/1502

AUTHOR: Bondarenko, N. G.; Yeremina, I. V.; Talanov, V. I.

TITLE: Beam phase structure of a ruby laser

SOURCE: Zh. eksper. i teor. fiz., v. 46, no. 4, 1964, 1500-1502

TOPIC TAGS: beam phase structure, phase structure, ruby laser, ruby crystal, dielectric inhomogeneity, transparent dielectric, laser output analysis

ABSTRACT: An experimental method is described which makes possible a visual interpretation of the beam phase structure of any coherent oscillation. The method is based on the wave interference of the original beam and a partly scattered beam after it has passed through a dielectric transparent inhomogeneity whose dimensions are small enough in comparison with the beam width. The interference picture provides reliable information regarding the structural characteristics of a beam phase front. The scattered radiation at a distance $d >> a^2/\lambda$ from an inhomogeneity (where a is the dimension of the inhomo-

ACCESSION NR. AP4031189

geneity), represents a spherical wave whose phase center is located in the inhomogeneity. Interference pictures were obtained at various distances (75, 155, and 900 cm) from the external mirrors of a ruby generator (λ=0.694μ) with a crystal 7.2 cm long and 0.6 cm in diameter. The experimental results indicate the importance of this method of phase measuring for the study of lasers. Orig. art. has: 2 figures and 2 formulas.

ASSOCIATION: Radiofizicheskiy institut gor'kovskogo gosudarstvennogo universiteta (Institute of Radio Physics, Gorky State University)

SUBMITTED: 09Dec63 DATE ACQ: 07May64 ENCL: 00

SUB CODE: PH NO REF SOV: 001 OTHER: 002

Card 2/2

L 9564-66 FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB IJP(c) WG/GG

ACC NR: AP5026098 SOURCE CODE: UR/0386/65/002/005/0218/0222

69

67

B

AUTHOR: Talanov, V. I. 44,55

44,55

ORG: Scientific Research Institute of Radiophysics, Gorky (Nauchno-issledovatel'skiy radiofizicheskiy institut)

TITLE: Self-trapping of wave beams in nonlinear media

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 5, 1965, 218-222

21, 44,55

21, 44,55

TOPIC TAGS: laser, nonlinear optics, self trapping, self focusing nonlinear dielectric

ABSTRACT: A theoretical analysis is conducted of self-trapping of beams in an anisotropic slightly nonlinear dielectric using a quasi-optical approximation. The beam structure in the region of the maximum and the minimum of the field is analyzed for the special case of a spherical beam with a variable radius of curvature (geometric optics approximation). A solution is also obtained for the Gaussian type beams for both two- and three-dimensional cases. It is shown that when $P/P_{st} < 1$, where P is the beam power and P_{st} is the power of a stationary beam, the beam will always become untrapped. For $P/P_{st} > 1$, self-trapping will be achieved. It is pointed out that nonlinear energy absorption and dielectric breakdown will be achieved before the self-trapping can be terminated at very high intensities of the light beam. As a result

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APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001754730004-0

L 60165-65 EWA(h)/EWT(1) Peb

ACCESSION NR: AP5014503 UR/0141/65/008/002/0260/0271
535.1

26
25
B

AUTHOR: Talanov, V. I.

TITLE: Operator method for describing wave beams in combined quasioptical systems

SOURCE: IVUZ. Radiofizika, v. 8, no. 2, 1965, 260-271

25

TOPIC TAGS: quasioptical system, wave beam passage, amplitude phase converter, quasioptical waveguide, quasioptical resonator, operator method

ABSTRACT: In view of the fact that quasioptical waveguides and resonators are frequently used as components of more complicated systems, the calculations for which are quite cumbersome, the author proposes to simplify the computation by using an operator method, and presents the fundamental equations for the operators encountered in the theory of wave beams. The operators included are the Green's function operator, the operator for the transformation of a single beam by an arbitrary converter, the Fourier transformation operator, the transverse beam displacement operator, the beam scale-transformation operator, and the operator of a diaphragm made of an ideally absorbing screen. The passage of a wave beam through the system of amplitude-phase converters constituting the quasioptical waveguide or resonator is described in terms of a series of linear operators corresponding to the individual elements of the system. The principal relations between these

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ACCESSION NR: AP5014503

operators are written out and it is shown by means of examples that they can be employed to realize equivalent transformations of quasioptical systems and thus facilitate their design. Although the examples were limited to phase converters of the wave beam, the general relations derived can be used in the analysis of systems of linear and quadratic amplitude-phase converters with complex parameters. Orig. art. has: 6 figures and 47 formulas.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Radiophysics Institute at the Gor'kiy University)

SUBMITTED: 05May64 ENCL: 00 SUB CODE: EC, MA

NR REF SOV: 002 OTHER: 008

Card 2/2